



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
REGION II
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ATLANTA, GEORGIA 30303-1257

May 3, 2017

Mr. Daniel Stoddard
Senior Vice President and Chief Nuclear Officer
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, VA 23060-6711

**SUBJECT: SURRY POWER STATION – NRC INTEGRATED INSPECTION REPORT
05000280/2017001 AND 05000281/2017001**

Dear Mr. Stoddard:

On March 31, 2017, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your Surry Power Station, Units 1 and 2. On April 19, 2017, the NRC inspectors discussed the results of this inspection with Mr. F. Mladen and other members of your staff. Inspectors documented the results of this inspection in the enclosed inspection report.

NRC inspectors documented one finding of very low safety significance (Green) in this report. This finding involved a violation of NRC requirements. The NRC is treating this violation as a non-cited violation (NCV) consistent with Section 2.3.2.a of the NRC Enforcement Policy.

If you contest the violation or significance of this NCV, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Surry Power Station.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region II; and the NRC Resident Inspector at the Surry Power Station.

D. Stoddard

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Sincerely,

/RA/

Anthony D. Masters, Chief
Reactor Projects Branch 5
Division of Reactor Projects

Docket Nos.: 50-280, 50-281
License Nos.: DPR-32, DPR-37

Enclosure:
IR 05000280/2017001, 05000281/2017001
w/Attachment: Supplemental Information

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05000280/2017001 AND 05000281/2017001 May 3, 2017

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U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.: 50-280, 50-281

License Nos.: DPR-32, DPR-37

Report No: 05000280/2017001, 05000281/2017001

Licensee: Virginia Electric and Power Company (VEPCO)

Facility: Surry Power Station, Units 1 and 2

Location: 5850 Hog Island Road
Surry, VA 23883

Dates: January 1, 2017 – March 31, 2017

Inspectors: P. McKenna, Senior Resident Inspector
E. Andrews, Acting Senior Resident Inspector (2/5-3/31)
C. Jones, Resident Inspector
B. Caballero, Senior Operations Engineer (1R11)
M. Kennard, Operations Engineer (1R11)

Approved by: Anthony D. Masters, Chief
Reactor Projects Branch 5
Division of Reactor Projects

Enclosure

SUMMARY

IR 05000280/2017001, 05000281/2017001;01/01 /2017-03/31 /2017; Surry Power Station Units 1 and 2: Licensed Operator Requalification Program.

The report covered a three-month period of inspection by resident inspectors and region-based inspectors. The inspectors identified one non-cited violation (NCV) of very low safety significance. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP), dated April 29, 2015. The cross-cutting aspects were determined using IMC 0310, "Components Within The Cross-Cutting Areas" dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

Cornerstone: Mitigating Systems

- Green. An NRC-identified NCV of 10 CFR 55.49, "Integrity of examinations and tests," was identified for the licensee's failure to adhere to the requirements of TR-AA-730, Licensed Operator Biennial and Annual Operating Requalification Exam Process, Revision 9. TR-AA-730 was the procedure that the licensee used to implement industry standard ACAD 07-001, Guidelines for the Continuing Training of Licensed Personnel. ACAD 07-001 is a methodology which can be used to fulfill 10 CFR 55.59(c), "Requalification program requirements" and 10 CFR 55.4, "Systems approach to training (SAT)." This violation has been entered into the licensee's corrective action program (CAP) as condition report (CR) 1058649. The performance deficiency was determined to be more than minor because, if left uncorrected, it had the potential to lead to a more significant safety concern with the administration of the operating exams. The inspectors assessed the significance in accordance with Manual Chapter 0609, Significance Determination Process, Appendix I, Licensed Operator Requalification Significance Determination Process (SDP). The finding was determined to be of very low safety significance (Green) because there was no evidence that a licensed operator had actually gained an unfair advantage on an examination required by 10 CFR 55.59. The finding was directly related to the cross-cutting aspect of Complacency in the cross-cutting area of Human Performance because the training staff was aware of the TR-AA-730 requirements for annual operating exam scenario overlap, but justified an alternative method of exam security that was used in the past. [H.12] (Section 1R11.1)

REPORT DETAILS

Summary of Plant Status

Unit 1 operated at or near rated thermal power (RTP) until March 29, 2017, when reactor power was reduced to 94 percent following closure of the #3 turbine governor valve. The unit operated at 94 percent for the remainder of the inspection period.

Unit 2 operated at or near RTP throughout the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection

Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

The inspectors performed a site-specific weather-related inspection due to anticipated adverse weather conditions, specifically extreme cold and snow January 7 – 10, 2017. The inspectors reviewed the licensee's preparations for potential severe weather as well as severe weather procedure 0-OP-ZZ-021, "Severe Weather Preparation," Revision 17. The inspectors walked down site areas which included the electrical switchyard, emergency diesel generators, emergency switchgear rooms, emergency service water pump house, and the turbine, safeguards, and auxiliary buildings. During the walkdown, the inspectors looked for loose items and/or debris that could become a missile hazard during high winds, verified flooding barriers were available and/or in place, and verified that the emergency equipment was available and in the required standby mode. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R04 Equipment Alignment

Partial Walkdown

a. Inspection Scope

The inspectors conducted three equipment alignment partial walkdowns to evaluate the operability of selected redundant trains or backup systems, listed below, with the other train or system inoperable or out of service. The inspectors reviewed the functional systems descriptions, system operating procedures, and Technical Specifications (TS) to determine correct system lineups for the current plant conditions. The inspectors performed walkdowns of the systems to verify that critical components were properly aligned and to identify any discrepancies which could affect operability of the redundant train or backup system. Documents reviewed are listed in the Attachment.

- #1 and #2 emergency diesel generators during the monthly #3 emergency diesel generator performance test
- Unit 2 'A' and 'C' charging pumps during 'B' charging pump performance testing
- Unit 2 'B' motor driven auxiliary feedwater pump and turbine driven auxiliary feedwater pump during 'A' motor driven auxiliary feedwater pump testing

b. Findings

No findings were identified.

1R05 Fire Protection

.1 Quarterly Fire Protection Reviews

a. Inspection Scope

The inspectors conducted tours of the five areas listed below that are important to reactor safety to verify the licensee's implementation of fire protection requirements as described in fleet procedures CM-AA-FPA-100, "Fire Protection/Appendix R (Fire Safe Shutdown) Program," Revision 11, CM-AA-FPA-101, "Control of Combustible and Flammable Materials," Revision 8, and CM-AA-FPA-102, "Fire Protection and Fire Safe Shutdown," Revision 7. The reviews were performed to evaluate the fire protection program operational status and material condition and the adequacy of: (1) control of transient combustibles and ignition sources; (2) fire detection and suppression capability; (3) passive fire protection features; (4) compensatory measures established for out-of-service, degraded or inoperable fire protection equipment, systems, or features; and (5) procedures, equipment, fire barriers, and systems so that post-fire capability to safely shutdown the plant is ensured. The inspectors reviewed the corrective action program to verify fire protection deficiencies were being identified and properly resolved.

- Main Control Room
- Unit 1 Safeguards
- Unit 2 Safeguards
- #3 Emergency Diesel Generator Room
- Auxiliary Building Basement

b. Findings

No findings were identified.

.2 Annual Drill Observation

a. Inspection Scope

The inspectors observed an unannounced fire drill on January 26, 2017, that took place in the #1 Emergency Diesel Generator Room. The drill was observed to evaluate the readiness of the plant fire brigade to fight fires. The Inspectors verified that the licensee staff identified deficiencies, openly discussed them in a self-critical manner at the debrief, and took appropriate corrective actions as required. Specific attributes evaluated were: (1) proper wearing of turnout gear and self-contained breathing apparatus; (2) proper uses and layout of fire hoses; (3) employment of appropriate firefighting techniques; (4) sufficient firefighting equipment brought to the scene; (5) effectiveness of command and control; (6) search for victims and propagation of the fire

into other plant areas; (7) smoke removal operations; (8) utilization of pre-planned strategies; (9) adherence to the pre-planned drill scenario; and (10) drill objectives.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program

.1 Biennial Review of Licensed Operator Requalification Program

a. Inspection Scope

The inspectors reviewed the facility operating history and associated documents in preparation for this inspection. During the week of January 23, 2017, the inspectors reviewed documentation, interviewed licensee personnel, and observed the administration of operating tests associated with the licensee's operator requalification program. Each of the activities performed by the inspectors was done to assess the effectiveness of the facility licensee in implementing requalification requirements identified in 10 CFR Part 55, "Operators' Licenses." The evaluations were also performed to determine if the licensee effectively implemented operator requalification guidelines established in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," and Inspection Procedure 71111.11, "Licensed Operator Requalification Program." The inspectors also evaluated the licensee's simulation facility for adequacy for use in operator licensing examinations using ANSI/ANS-3.5-2009, "American National Standard for Nuclear Power Plant Simulators for use in Operator Training and Examination." The inspectors observed two crews during the performance of the operating tests. Documentation reviewed included written examinations, Job Performance Measures (JPMs), simulator scenarios, licensee procedures, on-shift records, simulator modification request records, simulator performance test records, operator feedback records, licensed operator qualification records, remediation plans, watchstanding records, and medical records. The records were inspected using the criteria listed in Inspection Procedure 71111.11. Documents reviewed are listed in the Attachment.

b. Findings

Introduction: A Green NRC-identified NCV of 10 CFR 55.49, "Integrity of examinations and tests", was identified for the licensee's failure to adhere to requirements of TR-AA-730, Licensed Operator Biennial and Annual Operating Requalification Exam Process, Revision 9, specifically exam scenario overlap standards. TR-AA-730 was the procedure that the licensee used to implement industry standard ACAD 07-001, Guidelines for the Continuing Training of Licensed Personnel. ACAD 07-001 is a methodology which can be used to fulfill 10 CFR 55.59(c), "Requalification program requirements" and 10 CFR 55.4, "Systems approach to training (SAT)."

Description: The inspectors' review of the licensee's 2016 annual operating examination schedule identified the following examination overlap issue:

One Licensed Operator crew failed one of two scenarios administered during the annual operating exam in January 2016. After the crew was retrained, the training staff administered a retake exam, which consisted of two different scenarios. During the same examination cycle, in February 2016, the licensee's training staff administered the

same two scenarios to a different Licensed Operator crew even though the scenarios were previously administered. Procedure TR-AA-730, Section 3.6.1.d required that annual operating examinations administered to different Licensed Operators during different weeks of the exam cycle repeat less than or equal to 50 percent of the scenario events that have previously been administered during the exam cycle.

Analysis: The inspectors determined that the licensee's failure to adhere to TR-AA-730 exam scenario overlap standards was a performance deficiency. The performance deficiency was determined to be more than minor because, if left uncorrected, it had the potential to lead to a more significant safety concern with inadequate administration of the operating exams and operations that could lead to operational events. The inspectors assessed the significance in accordance with Manual Chapter 0609, Significance Determination Process, Appendix I, Licensed Operator Requalification Significance Determination Process (SDP), December 06, 2011. The finding was related to requalification exam security because it involved test item repetition between requalification examinations administered during different weeks of a training cycle. The finding was determined to be of very low safety significance (Green) because there was no evidence that a licensed operator had actually gained an unfair advantage on an examination required by 10 CFR 55.59. The finding was directly related to the cross-cutting aspect of Complacency in the cross-cutting area of Human Performance because the training staff was aware of the TR-AA-730 requirements for annual operating exam scenario overlap, but justified an alternative method of exam security that was used in the past. [H.12]

Enforcement: 10 CFR 55.49 stated "Applicants, licensees, and facility licensees shall not engage in any activity that compromises the integrity of any application, test, or examination required by this part. The integrity of a test or examination is considered compromised if any activity, regardless of intent, affected, or but for detection, would have affected the equitable and consistent administration of the test or examination. This includes activities related to the preparation, administration, and grading of the tests and examinations required by this part." 10 CFR Part 55.59, "Requalification", requires administration of an annual operating exam to all licensed operators. Contrary to the above, on January 26, 2017, the inspectors identified that the licensee failed to ensure test integrity was not compromised but for detection when the licensee administered two scenarios to a Licensed Operator crew in February 2016, even though the scenarios had already previously been administered to another crew during the same 2016 annual operator examination cycle. TR-AA-730 was the procedure that the licensee used to implement industry standard ACAD 07-001, "Guidelines for the Continuing Training of Licensed Personnel." ACAD 07-001 was not adequately implemented as a methodology which can be used to fulfill 10 CFR 55.59(c), "Requalification program requirements" and 10 CFR 55.4, "Systems Approach to training (SAT)." Because this finding is of very low safety significance and has been entered into the licensee's corrective action program as CR 1058649, the violation is being treated as a Non-Cited Violation consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000280, 281/2017001-01, Failure to Maintain Requalification Examination Integrity.

.2 Resident Inspector Quarterly Review

a. Inspection Scope

The inspectors observed and evaluated a licensed operator simulator exercise given on February 7, 2017. The scenario involved a feed flow indicator failure, a reactor downpower, steam generator tube rupture requiring a manual reactor trip, and declaration of an alert. The inspectors observed the crew's performance to determine whether the crew met the scenario objectives; accomplished the critical tasks; demonstrated the ability to take timely action in a safe direction and to prioritize, interpret, and verify alarms; demonstrated proper use of alarm response, abnormal, and emergency operating procedures; demonstrated proper command and control; communicated effectively; and appropriately classified events per the emergency plan. The inspectors observed the post training critique to determine that weaknesses or improvement areas revealed by the training were captured by the instructor and reviewed with the operators. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

.3 Resident Inspector Observation of Control Room Operations

a. Inspection Scope

During the inspection period, the inspectors conducted two observations of licensed reactor operator activities to ensure consistency with licensee procedures and regulatory requirements. For the following activities, the inspectors observed the following elements of operator performance: 1) operator compliance and use of plant procedures including technical specifications; 2) control board component manipulations; 3) use and interpretation of plant instrumentation and alarms; 4) documentation of activities; 5) management and supervision of activities; and 6) control room communications. Documents reviewed are listed in the Attachment.

- On February 14, 2-PT-8.4, "Consequence Limiting Safeguards (Hi-Train)," Revision 14
- On March 14, 2-OPT-SI-005, "LHSI Pump Test," Revision 33

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

For the two equipment issues described in the condition reports listed below, the inspectors evaluated the effectiveness of the corresponding licensee's preventive and corrective maintenance. The inspectors performed a detailed review of the problem history and associated circumstances, evaluated the extent of condition reviews, as required, and reviewed the generic implications of the equipment and/or work practice problem(s). Inspectors performed walkdowns of the accessible portions of the system, performed in-office reviews of procedures and evaluations, and held discussions with

system engineers. The inspectors compared the licensee's actions with the requirements of the Maintenance Rule (10 CFR 50.65), station procedures ER-AA-MRL-10, "Maintenance Rule Program," Revision 6, and ER-AA-MRL-100, "Implementing Maintenance Rule," Revision 11. Documents reviewed are listed in the Attachment.

- CR 1059846, U1 LHSI pump common discharge relief line leakage
- CR 1060862, 1-VS-S-1A not entered in PRA prior to tagout

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors evaluated, as appropriate, the four activities listed below for the following: (1) the effectiveness of the risk assessments performed before maintenance activities were conducted; (2) the management of risk; (3) that, upon identification of an unforeseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and, (4) that maintenance risk assessments and emergent work problems were adequately identified and resolved. The inspectors verified that the licensee was complying with the requirements of 10 CFR 50.65(a) (4) and the data output from the licensee's safety monitor associated with the risk profile of Units 1 and 2. The inspectors reviewed the corrective action program to verify deficiencies in risk assessments were being identified and properly resolved.

- On January 11 and 12, Unit 1 and 2 risk during #1 emergency diesel generator maintenance outage.
- On January 18, Unit 1 and 2 risk while "C" emergency service water pump and "E" main control room chiller were inoperable for maintenance and the Unit 2 "A" charging pump and main control room service water pump and valve performance tests were in progress.
- On March 1, Unit 1 and 2 risk while emergency switchgear room back flow preventor was out of service for testing with high winds in the area.
- On March 27, Unit 1 risk during completion of 1-PT-18.8, "Charging Pump Service Water Performance".

b. Findings

No findings were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the six operability evaluations listed below, affecting risk-significant mitigating systems, to assess as appropriate: (1) the technical adequacy of the evaluations; (2) whether continued system operability was warranted; (3) whether other existing degraded conditions were considered; (4) if compensatory measures were involved, whether the compensatory measures were in place, would work as intended, and were appropriately controlled; and (5) where continued operability was considered unjustified, the impact on TS Limiting Conditions for Operation and the risk significance.

The inspectors' review included verification that operability determinations were made as specified in OP-AA-102, "Operability Determination," Revision 15. The inspectors reviewed the licensee's corrective action program to verify deficiencies in operability determinations were being identified and corrected.

- CR 1060090, EDG #1 Generator Health Assessment Report
- CR 1059846, U1 LHSI pump common discharge relief line leakage
- CR 1061190, 1-SW-315 disc is laying in bottom of valve body
- CR 1062131, O-ring does not fit on 1-SW-P-1C strainer
- CR 1062437, Dry Boric Acid Discovered Downstream of 1-CH-FI-100
- CR 1063297, EDG #3 field failed to flash

b. Findings

No findings were identified.

1R18 Plant Modifications

Permanent Modification

a. Inspection Scope

The inspectors reviewed the completed permanent plant modification design change package (DCP) SU-16-01090, "Unit 1 Isolated Phase Bus Duct B Phase to C Phase Generator Bonding Plate Relocation." The inspectors conducted walkdowns of the installation after completion, reviewed the 10 CFR 50.59 Safety Review/Regulatory Screening, technical drawings, test plans and the modification package to assess the TS implications. The inspectors also verified that the permanent modification was in accordance with licensee procedure CM-AA-DDC-201, "Design Changes," Revision 20. In addition, the inspectors reviewed calculations and conducted interviews with licensee personnel.

b. Findings

No findings were identified.

1R19 Post Maintenance Testing

a. Inspection Scope

The inspectors reviewed five post maintenance test procedures and/or test activities for selected risk-significant mitigating systems listed below, to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; (2) testing was adequate for the maintenance performed; (3) acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy consistent with the application; (5) tests were performed as written with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and (8) equipment was returned to the status required to perform in accordance with VPAP-2003, "Post Maintenance Testing Program," Revision 14. Documents reviewed are listed in the Attachment.

- 1-OPT-EG-009, Rev. 56 and 1-OPT-EG-005, Rev. 23 after #1 EDG maintenance outage.
- 1-OPT-FW-001, Rev. 36, MDAFW PT after maintenance package performed on motor and pump.
- 0-OPT-SW-003, Rev. 57, ESW Pump 1-SW-P-1C PT after maintenance package on engine and pump.
- 1-IPT-CC-CW-L-103, Rev. 17, Intake Canal Level Probe 1-CW-LS-103 Time Response Test and Channel Calibration
- 0-ICP-FC-L-105-1, Rev. 4, Spent Fuel Pool Level 1-FC-L-105-1 Calibration

b. Findings

No findings were identified.

1R22 Surveillance Testing

a. Inspection Scope

For the four surveillance tests listed below, the inspectors examined the test procedures, witnessed testing, or reviewed test records and data packages, to determine whether the scope of testing adequately demonstrated that the affected equipment was functional and operable, and that the surveillance requirements of TS were met. The inspectors also determined whether the testing effectively demonstrated that the systems or components were operationally ready and capable of performing their intended safety functions. Documents reviewed are listed in the Attachment.

In-Service Testing

- 1-OPT-EG-001, Rev. 69, Number 1 Emergency Diesel Generator Monthly Performance Test
- 1-OPT-SI-005, Rev. 32, LHSI Pump Test

Surveillance Testing:

- 2-OPT-FW-003/007, Unit 2 Turbine Driven Auxiliary Feedwater Pump Performance Test and Steam Supply Valve Test
- 1-PT-8.1, Rev. 43 and 2-PT-8.1, Rev. 37, Surveillance Frequency Change for Reactor Protection System Logic

b. Findings

No findings were identified.

1EP6 Drill Evaluation

Emergency Preparedness (EP) Drill

a. Inspection Scope

On March 28, 2017, the inspectors reviewed and observed licensee EP drill involving dropped control rod, loss of coolant accident, and radiological release. The inspectors assessed the licensee emergency procedure usage, emergency plan classifications,

notifications, and protective actions recommendation development. The inspectors evaluated the adequacy of the licensee's conduct of the drill and post-drill critique performance. The inspectors verified that the drill critique identified drill performance weaknesses and entered these items into the licensee's CAP. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

Cornerstones: Initiating Events, Mitigating Systems (MSs), Barrier Integrity, Emergency Preparedness, Public Radiation Safety, and Occupational Radiation Safety

4OA1 Performance Indicator (PI) Verification

a. Inspection Scope

The inspectors performed a periodic review of the six following Unit 1 and 2 PIs to assess the accuracy and completeness of the submitted data and whether the performance indicators were calculated in accordance with the guidance contained in NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7. The inspection was conducted in accordance with NRC Inspection Procedure 71151, "Performance Indicator Verification." Specifically, the inspectors reviewed the Unit 1 and Unit 2 data reported to the NRC for the period January 1, 2016 – December 31, 2016. Documents reviewed included applicable NRC inspection reports, licensee event reports, operator logs, station performance indicators, and related CRs. Documents reviewed are listed in the Attachment.

- Unit 1 and 2 Unplanned Scrams
- Unit 1 and 2 Unplanned Scrams with Complications
- Unit 1 and 2 Unplanned Power Changes per 7000 Critical Hours

b. Findings

No findings were identified.

4OA2 Identification and Resolution of Problems

.1 Daily Reviews of items Entered into the Corrective Action Program:

a. Inspection Scope

As required by NRC Inspection Procedure 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished by reviewing daily CR report summaries and periodically attending daily CR review team meetings. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

.2 Annual Sample: Review of CR 1055998 Corrective Actions for 'A' Main Feedpump Outboard Seal Failure

a. Inspection Scope

The inspectors performed a review regarding the licensee's assessments and corrective actions associated with CR 1055998, "1-FW-P-1A Outboard Pump Seal Failed." Specifically, on December 15, 2016, operations ramped Unit 1 to 60% power following indication of an increased temperature on the outboard bearing temperature for the 'A' main feedwater pump, 1-FW-P-1A indicative of an outboard pump seal failure. The failed outboard pump seal was subsequently replaced, and Unit 1 returned to 100% power on December 18, 2016.

The inspectors assessed the licensee's problem identification threshold, root cause analysis, extent of condition reviews, compensatory actions, and the prioritization and timeliness of the licensee's corrective actions to determine whether the licensee was appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of the licensee's corrective action program as specified in procedure, PI-AA-200, "Corrective Action Program," Revision 33 and 10 CFR 50, Appendix B. In addition, the inspectors reviewed the corrective action program for similar issues, and interviewed engineering personnel to assess the effectiveness of the implemented corrective actions. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

The licensee determined that the root cause was failure to develop and implement a precision alignment process for the main feedwater pumps and tandem motors, which resulted in a failure of the pump seal. A contributing cause was the main feedwater pumps were run outside of the best efficiency point, which caused large shaft vibrations resulting in premature degradation of mechanical seals. The licensee determined that plant procedures did not provide sufficient detail for performing alignments on the main feedwater pumps. On December 15, 2016, the main feedwater pump lost lubrication fluid film resulting in severe heating of the sealing surfaces, ultimately causing the pump outboard seal to fail.

Corrective actions taken or planned by the licensee include working with a rotating equipment alignment vendor and revising the main feedwater pump motor locating and motor maintenance procedures accordingly. The procedures will incorporate improvements for performing as-found alignments on the main feedwater pumps. The inspectors verified that the licensee had identified problems with this issue at an appropriate threshold and entered them into the CAP; and had proposed or implemented appropriate corrective actions. The inspectors determined that the corrective actions developed as a result of the root cause analysis were reasonable commensurate with the safety significance of the main feedwater system.

.3 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a review of the licensee's corrective action program documents to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review was focused on repetitive equipment and corrective maintenance issues, but also considered the results of daily inspector corrective action program item screening discussed in Section 4OA2.1. The review included issues documented outside the normal correction action program in system health reports, corrective maintenance work orders, component status reports, site monthly meeting reports, and maintenance rule assessments. The inspectors' review nominally considered the six month period of July through December, 2016, although some examples expended beyond those dates when the scope of the trend warranted.

The inspectors compared and contrasted their results with the results contained in the licensee's latest integrated quarterly assessment report. Corrective actions associated with a sample of the issues identified in the licensee's trend report were reviewed for adequacy.

b. Findings

No findings of significance were identified. In general, the licensee has identified trends and has addressed the trends with their corrective action program (CAP). No new adverse trends were identified this period that had not already been identified by the licensee.

4OA5 Other Activities

(Closed) 2515/TI-192, "Inspection of the Licensee's Interim Compensatory Measures Associated With the Open Phase Condition Design Vulnerabilities in Electric Power Systems"

a. Inspection Scope

The objective of this performance based Temporary Instruction is to verify implementation of interim compensatory measures associated with an open phase condition design vulnerability in electric power system for operating reactors. The inspectors conducted an inspection to determine if Dominion had implemented the following interim compensatory measures. These compensatory measures are to remain in place until permanent automatic detection and protection schemes are installed and declared operable for open phase condition design vulnerability. The inspectors verified the following:

- Dominion identified and discussed with plant staff the lessons-learned from the open phase condition events at US operating plants including the Byron Station open phase condition and its consequences. This included conducting operator training for promptly diagnosing, recognizing consequences, and responding to an open phase condition.
- Dominion updated plant operating procedures to help operators promptly diagnose and respond to open phase conditions on off-site power sources credited for safe shutdown of the plant.

- Dominion established and implemented periodic walkdown activities to inspect switchyard equipment such as insulators, disconnect switches, and transmission line and transformer connections associated with the offsite power circuits to detect a visible open phase condition.
- Dominion ensured that routine maintenance and testing activities on switchyard components have been implemented and maintained. As part of the maintenance and testing activities, the licensee assessed and managed plant risk in accordance with 10 CFR 50.65(a) (4) requirements.

Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

4OA6 Meetings, Including Exit

Exit Meeting Summary

On April 19, 2017, the inspection results were presented to Mr. F. Mladen and other members of his staff, who acknowledged the findings. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

L. Baker, Training Manager
J. Eggart, Manager, Emergency Preparedness
B. Garber, Manager, Station Licensing
M. Haduck, Manager, Outage and Planning
R. Johnson, Manager, Operations
R. Jones, Manager, Protection Services
D. Lawrence, Director, Station Safety and Licensing
F. Mladen, Site Vice President
T. Ragland, Manager, Radiological Protection and Chemistry
J. Rosenberger, Director, Station Engineering
R. Simmons, Plant Manager
E. Turko, ISI Supervisor
D. Wilson, Manager, Maintenance

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened and Closed

05000280, 281/2017001-01	NCV	Failure to Maintain Requalification Examination Integrity (Section 1R11.1)
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Closed

2515/TI-192	TI	Inspection of the Licensee's Interim Compensatory Measures Associated with the Open Phase Condition Design Vulnerabilities in Electric Power Systems (Section 4OA5)
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LIST OF DOCUMENTS REVIEWED

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Procedures

0-OP-ZZ-021, Severe Weather Preparation, Rev. 17

Condition Reports

1057194 1057274 1057275 1057276 1057319 1057332
1057343 1057381

Section 1R04: Equipment Alignment

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1-OP-EG-001A, EDG 1 System Alignment, Rev. 13

2-OP-EG-001A, EDG 2 System Alignment, Rev. 13

2-OP-51.5A, Charging Pump CC & SW Systems Valve Alignment, Rev. 17

2-OP-FW-001A, Auxiliary Feedwater System Valve Alignment, Rev. 8

Condition Reports

1062738

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11448-FB-046A SH2, Flow/Valve Operating Numbers Diagram Emergency Diesel Generator #1 Unit 1, Rev. 16

11448-FB-046B SH1, Flow/Valve Operating Numbers Diagram Emergency Diesel Generator #2 Unit 1, Rev. 25

11548-FM-068A SH 3, Flow/Valve Operating Numbers Diagram Feedwater System Surry Power Station Unit 2, Rev. 68

Section 1R05: Fire Protection

Procedures

0-FS-FP-116, Control Room Elevation 27 Feet – 6 inches, Rev. 6

0-FS-FP-121, Diesel Generator Room Number 1 Elevation 27 Feet – 6 Inches, Rev. 2

0-FS-FP-123, Diesel Generator Room Number 3 Elevation 27 Feet – 6 inches, Rev. 2

0-LSP-FP-045, Fire Extinguisher Annual Maintenance, Rev. 2

1-FS-FP-139, Safeguards Valve Pit – Unit 1 Elevation 28 Feet – 6 inches, 19 Feet – 6 inches, and 12 Feet, Rev. 2

1-FS-FP-140, Safeguards Basement – Unit 1 Elevation 11 Feet – 6 inches, Rev. 2

1-FS-FP-141, Safeguards Spray Side – Unit 1 Elevation 27 Feet – 6 inches, Rev. 2

1-FS-FP-152, Basement – Unit 1 Auxiliary Building Elevation 2 Feet, Rev. 2

2-FS-FP-139, Safeguards Valve Pit – Unit 2 Elevation 28 Feet – 6 inches, 19 Feet – 6 inches, and 12 Feet, Rev 1

2-FS-FP-140, Safeguards Basement – Unit 2 Elevation 11 Feet – 6 inches, Rev. 3

2-FS-FP-141, Safeguards Spray Side – Unit 2 Elevation 27 Feet – 6 inches, Rev. 2

2-FS-FP-152, Basement Area – Unit 2 Auxiliary Building Elevation 2 Feet, Rev. 2

CM-AA-FPA-100, Fire Protection/Appendix R (Fire Safe Shutdown) Program, Rev. 11

SA-AA-115, Conduct of Fire Drills, Rev. 2

Drawings

11448-FAR-201 SH 2, Equipment Location – Appendix ‘R’ Reactor Containment, MSVH, S.G Area & Quench Spray Pump House Plan – EI 18’4”, Rev. 11448-FAR-202 SH 2, Equipment Location – Appendix ‘R’ Reactor Containment, MSVH, & S.G Area Plan – EI 18’4”, Rev. 8

11448-FAR-205, SH 1, Equipment Location – Appendix ‘R’ Auxiliary Building Plan – EI 2’0”, Rev. 18

11448-FAR-206 SH 4, Equipment Location – Appendix ‘R’ Service Building Part Plan – EI 27’0”, Rev. 20

11448-FAR-206 SH 6, Equipment Location – Appendix ‘R’ Service Building Part Plan – EI 27’0”, Rev. 8

Other Documents

Fire Drill Scenario 1st Quarter, 2017

Section 1R11: Licensed Operator Regualification ProgramProcedures

2-PT-8.4, Consequence Limiting Safeguards (Hi-Train), Rev. 14

TR-AA-730, Licensed Operator Biennial and Annual Operating Regualification Exam Process, Revision 9

SU-PROC-000-0-AP-1.00, Rev. 27, Rod Control System Malfunction

SU-PROC-000-1-AP-9.00, Rev. 41, RCP Abnormal Conditions

SU-PROC-000-1-AP-10.03, Rev. 19, Loss of Vital Bus III

SU-PROC-000-0-AP-10.08, Rev. 31, Station Power Restoration

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SU-PROC-000-0-AP-37.00, Rev. 17, Seismic Event

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SU-PROC-000-1-E-3, Rev. 51, Steam Generator Tube Rupture

SU-PROC-000-EPIP-1.01, REV 57, Emergency Manager Controlling Procedure

SU-PROC-000-EPIP-1.06, Rev. 11, Protective Action Recommendations

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SU-PROC-000-1-ES-1.3, Rev. 20, Transfer to Cold Leg Recirculation

SU-PROC-000-1-ES-1.4, Rev. 8, Transfer to Hot Leg Recirculation

SU-PROC-000-0-OP-FP-006, Rev. 14, Operation of Fire Protection Systems

SU-PROC-000-1-FR-H.1, Rev. 37, Response to Loss of Secondary Heat Sink

SU-PROC-000-1-FR-S.1, Rev. 26, Response to Nuclear Power Generation/ATWS

SU-PROC-000-1-OP-RX-004, Rev. 27, Calculation of Estimated Critical Conditions

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Medical Files (8)

Remedial Training Records (3)

Remedial Training Examinations (3)

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RQ-16.2-XB-4, Rev 0, 2-25-16

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 0-SPS-ANSI-23, Surry Simulator Performance Test Core Cycle 28 Upgrade Surry Unit 1, Rev.6

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0-SPS-ANSI-03, Surry Simulator Normal Evolution Test Nuclear Startup to Rated Power, Rev 4
 ANSI-03-Startup to Rated Power, Cycle 27 2015, Hot Shutdown to 2%, Rev. 0
 ANSI-03- Startup to Rated Power, Cycle 27 2015, 2% to 100%

Simulator Transient Tests:

Transient Test #10, Slow Primary System Depressurization to Saturated Conditions with PZR Relief on Safety Valve Stuck Open, Cycle 28, Rev. 0
 Transient Test #11, Simulator Maximum (200%/min) Design Load Rejection (100% to 50%), Cycle 28, Rev. 0

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 SR2016 NRC Scenario 3, 08/01/16
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 RQ-17.1-SE8, 11-29-16
 RQ-17.1-SE9, 12-14-16
 RQ-17.1-SE10, 12-14-16

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 201609290655, Governor Valve Leak by in Unit 1 Results in 190 rpm when Turbine Latched
 201611010827, Reconfiguration of Pressurizer Heaters (DC-SU-16-00107)
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 201306040730, BDB-FLEX Power for Essential Instrumentation and Equipment

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 RQ-17.1-SE-10, 2017 Operations Evaluation, Rev. 0, 12/20/2016

JPM Packages:

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 13.07-DRR, Isolate Service Water to #5 MER During Flooding, Rev. 20, 12/15/2016
 18.06A-DRR, Restore Offsite Power to IJ 4160V Emergency Bus IAW 0-AP-10.08, Rev. 8, 12/15/2016
 26.06B-DRR, Locally SWAP the AFW Pumps to the AFW Booster Pump alternate Suction Source, Rev. 16, 12/15/2016
 26.07-DRR, Cooldown a Vapor Bound Auxiliary Feedwater Pump, Rev. 10, 12/07/2016
 35.11A-DRR, Perform AP-10.03 Following an Electrical Transient on Vital Bus III, Rev. 0, 2/15/2016
 38.05A-DRR, Respond to lowering RCS Pressure, Rev. 4, 12/22/2016
 38.10B-DRR, Raise RCS Boron Concentration 500 ppm on Both Units in Accordance with AP-40.00, Rev. 0, 12/15/2016

38.12A-DRR, Respond to an RCP Thermal Barrier Cooler Tube Failure and RCP Seal Failure, Rev. 0, 12/22/2016

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0-ECM-0306-02, Motor Control Center Maintenance, Rev. 61

1-AP-38.00, Main Steam System Control Malfunction, Rev. 6

1-NPT-ZZ-001, Quantification of System External Leakage, Rev. 11

1-OPT-SI-003, Quarterly Test of SI MOVs and RWST Crosstie TVs, Rev. 24

1-OPT-SI-005, LHSI Pump Test, Rev. 32

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1004390	1053358	1058809	1059846	1060623	1060862
1060875	1060934				

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Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures

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1-PT-18.8, Charging Pump Service Water Performance, Rev. 38

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EOOS Schedulers Risk Evaluation for Surry Power Station, January 18, 2017

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Section 1R15: Operability Determinations and Functionality Assessments

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0-ECM-0701-01, Emergency Diesel Generator Maintenance, Rev. 17

0-ECM-0704-02, EDG Field Flash Cut Off (FFCO) Relay Replacement and/or Adjustment, Rev. 4
 0-EPM-0701-01, EDG Service and Inspection, Rev. 21
 0-MCM-1918-01, On-line Leak Repairs, Rev. 24
 0-OP-ZZ-009, ASME Code Class Leakage, Rev. 7
 0-OPT-EG-001, Number 3 Emergency Diesel Generator Monthly Start Exercise Test, Rev. 74
 0-OPT-EG-005, Number 3 Emergency Diesel Generator Fuel Oil System Test, Rev. 20
 0-OPT-SW-003, Emergency Service Water Pump 1-SW-P-1C, Rev. 3
 0-OPT-ZZ-008, ASME System Pressure Tests, Rev. 11
 0-OSP-EG-6.1, Number 3 Emergency Diesel Generator Lube Oil and Cooling Water Sampling, Rev. 13
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 1-OPT-EG-001, Number 1 Emergency Diesel Generator Monthly Start Exercise Test, Rev. 69
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 MA-AA-1002, Leakage Management, Rev. 5
 MPM-0210-01, Control Room Chillers Performance Checks, Rev. 31
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1059846	1060090	1060623	1060624	1060687	1060875
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Work Orders

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 ETE-NAF-2017-0031, Impact of Increased SI and Charging System Leakage on the Design Basis LOCA Radiological Analysis and Control Room, Rev. 0
 ETE-SU-2017-0018, Pipe Support for Leak Seal of CH Line, Rev. 0

ETE-SU-2017-0019, ASME 1 or 2 Evaluation of Leak Seal Repair of 1-CH-PP-0.5-CH-PIPE-239-152, Rev. 0

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Condition Reports

1035246 1053914 1055120

Other Documents

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DC 09-01021, Unit 2 Isolated Phase Duct Upgrade, Rev. 5

DC SU-16-01090, Unit 1 Isolated Phase Bus Duct B Phase to C Phase Generator Bonding Plate Relocation, Rev. 3

ETE SU-2014-1009, Repair of Unit 2 Isolated Phase Bus Duct Insulating Bellows, Rev. 0

Section 1R19: Post Maintenance Testing

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0-ICP-FC-L-105-1, SFP Level 1-FC-L-105-1 Calibration, Rev. 4

0-OPT-SW-003, Emergency Service Water Pump 1-SW-P-1C, Rev. 57

1-OPT-FW-001, Motor Driven Auxiliary Feedwater Pump 1-FW-P-3A, Rev. 36

1-IPT-CC-CW-L-103, Intake Canal Level Probe 1-CW-LS-103 Time Response Test and Channel Calibration, Rev. 17

1-OPT-EG-005, Number 1 Emergency Diesel Generator Fuel Oil System Tests, Rev. 23

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Condition Reports

1058085 1058106 1058171 1058373 1061231 1063052

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38103616442 38103668129 38103737240 38103798808

38103742933

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1-OPT-SI-005, LHSI Pump Test, Rev 32

1-PT-8.1, Reactor Protection System Logic (for Normal Operations), Rev. 43

2-OPT-FW-003, Turbine Driven Auxiliary Feedwater Pump 2-FW-P-2, Rev. 58

2-OPT-FW-007, Turbine Driven AFW Pump Steam Supply Line Check Valve Test, Rev. 7

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38103743663 38103743667

Other Documents

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 EPIP-1.04, Response to Site Area Emergency, Rev. 23
 EPIP-1.05, Response to General Emergency, Rev. 25
 EPIP-1.06, Protective Action Recommendations, Rev. 12
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 0-ECM-1406-01, Main Feedwater Pump Motor Maintenance, Rev. 33
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0-LOG-SBIS-001R, Service Building Inside Logs, Rev. 74

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1K-G1, Bus 1H Degraded Voltage, Rev. 4

1K-G8, Bus 1J Degraded Voltage, Rev. 6

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1028785 1028804 1030532 1033157 1062822

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